Remarks:

These remarks are responsive to the Office action dated September 4, 2007. Prior to entry of this response, claims 1-6, 8, and 12-14 were pending in the application. By way of this response, claim 3 is amended, and claims 15 and 16 are added. Applicants respectfully request reconsideration of the application and allowance of the pending claims.

Rejections under 35 U.S.C. § 103

Claims 1, 3, 6, 8, and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Number 5,740,675 (Shimasaki) in view of U.S. Patent Number 5,929,328 (Seidenfuss). Applicants make no comment on whether the above rejections are correct or incorrect, but rather have amended various claims and present the discussion below.

CLAIM 1

Applicants believe it may be helpful to first review some background information.

In one example, the present application calculates temperature of exhaust gasses using an exhaust gas sensor having a heating coil, such as an exhaust gas oxygen sensor. In this example, the controller coordinates the temperature calculation with the heater control, and calculates the temperature during a plurality of successive de-energized periods of the duty cycle.

The primary reference, Shimasaki, attempts to estimate the ambient temperature of the exhaust system using heating coil resistance, but uses switches separate from the duty cycle control, as admitted by the Office action. Such operation allows the temperature estimate to be independent from the heater operation, and therefore the temperature measurement will not be degraded by operation of the heater. *See*, for example, Col. 7, line 65 to Col. 8, line 3 of Shimasaki.

To cure the deficiency of Shimasaki, Seidenfuss is now cited. The Office action notes that Seidenfuss takes a different approach to temperature measurement than Shimasaki. In fact, Seidenfuss teaches that its measurement technique is useful for detecting the functionality of the heater, not for detecting temperature of the exhaust gasses. *See*, the Title, Abstract, and Detailed Description of Seidenfuss.

Applicants respectfully submit that one skilled in the art, confronted with the two cited references, would be met with several apparently irreconcilable features. First, Shimasaki is designed to control the heater function and temperature estimating function separately, so that the temperature reading is not confounded with the heater operation. On the other hand, Seidenfuss is principally concerned with detecting proper operation of the heater, not ambient exhaust system temperature. I.e., the particular operation of Seidenfuss (designed for diagnosing heater functionality) is exactly why it uses fewer switches.

The Office action ignores this conflict and makes the combination based on the assertion that:

> It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Seidenfuss for the system and method of Shimasaki because the teaching of Seidenfuss required fewer switches, thereby simplifying circuit construction.

Even assuming a person skilled in the art wanted to follow the above statement, the person would be immediately confronted by the fact that the simplified circuit of Seidenfuss works for diagnosing heater functionality, whereas the more complicated circuit of Shimasaki is designed to separate heater operation and ambient temperature measurements.

The above conflict is further exemplified by the additional statements asserted in the Office action. In particular, the Office action goes on to state that:

> 4. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize a measurement coordinated with the heater duty cycle, like that taught by Seidenfuss, for the system or method of Shimasaki for the added benefit that the duty cycle of the heater not be altered by the temperature measurement. In particular, Shimasaki presumably has set the duty cycle for the heater to a particular level that provides a desired temperature control. However, if any temperature measurement of Shimasaki would happen to occur during a time when the heater is supposed to be on (i.e. the ECU has turned switch Tr on), then the temperature measurement of Shimasaki would alter the effective duty cycle for the heater because the measurement means would have de-energized the heater irrespective of the duty cycle set for switch Tr. Utilizing Seidenfuss, which only measures a temperature when the heater was supposed to be off anyway would thereby prevent an altering of the effective heater duty cycle.

Again, these assertions ignore the fact that the system of Seidenfuss is not concerned with temperature measurement, but rather heater functionality. It is true that Shimasaki must alter the heater duty cycle when taking the temperature measurement. The reason is that Shimasaki is trying to detect ambient temperatures, not the functionality of the heater. Further, Seidenfuss does not teach measuring temperature when the heater was supposed to be off anyway. Rather, it teaches "interrupting" the heater operation once the probe has reached its operating temperature. See Col. 2, lines 64-65, and claim 1.

A second conflict between the cited references is that neither recognizes any way to coordinate heater heating with ambient temperature measurement. Again, one skilled in the art would be taught that ambient temperature measurements should be made independent from the heater control by Shimasaki, and that heater functionality should be diagnosed with a simplified circuit by Seidenfuss. Neither reference illustrates any way to coordinate heater heating with exhaust temperature measurement as set forth in Applicants' claims.

Additionally, the Office action relies on a general assertion that:

> With respect to the measurement occurring in a plurality of successive de-energized periods, one possessing ordinary skill in the art would recognize that more successive temperature measurements would provide more temperature measurements for the ECU. See the flowchart of fig. 5 of Shimasaki, which includes a temperature measurement in S102 that would presumably be repeated until NE, Tcat, TA, and TW are all affirmative. See Seidenfüss, col. 2, ll. 1-15 where the temperature measurement is utilized for regulation, which would inherently require successive temperature measurements.

Applicants have reviewed the cited disclosure and find no mention of calculating the exhaust gas temperature during a plurality of successive de-energized periods of the heater duty cycle. Rather, the assertion with respect to Fig. 5 of Shimasaki is admittedly based on a "presumption". Applicants find no basis for this presumption. Further, Applicants object to any use of inherency, and respectfully request evidence of record to substantiate any such assertions.

By using successive measurements as specified in claim 1, for example, it is possible to coordinate heater operation to maintain sufficient sensor temperature, with accurate exhaust gas temperature sensing. Applicants find no such disclosure in the cited art.

CLAIM 8

With regard to Claim 8, the Office action asserts that:

> 6. With respect to comparing a first exhaust gas temperature to a second exhaust gas temperature, Shimasaki shows in fig. 4 shows a comparison between different resistance values at different exhaust gas temperatures. This would read on the broadly defined comparing of a first exhaust temperature with a second exhaust temperature.

Even assuming the above assertion is true (that Shimisaki shows comparing different resistance values at different exhaust temperatures), Applicants can find no disclosure that such different temperatures are at different locations. Claim 8 specifically requires "comparing the first exhaust gas temperature with a second exhaust gas temperature, the second temperature at

a location in the exhaust gas system different from a location of the first temperature." Assuming different resistances are compared at different temperatures, this appears to assume that the same sensor is taking those readings. And if the same sensor takes the readings, Applicants are confused as to how it can change locations? Applicants therefore request clarification.

The above arguments apply to claims 1, 3, 6, 8, and 12-14. As such, these rejections should be withdrawn.

Claim 2

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shimasaki in view of Seidenfuss and U.S. Patent Number 4,524,264 (Takeuchi).

Claim 2 further specifies that the electrical circuit for generating a signal indicative of the resistance of said heating coil when said coil is de-energized comprises a Wheatstone bridge circuit operatively coupled to the exhaust gas sensor.

The Office action relies on Takeuchi, and states that based on Takeuchi, it would be obvious to place an exhaust gas sensor in a wheatstone bridge to regulate power supplied to the heater so that the heater maintains a constant temperature. This assertion brings to light several facts. First, that the prior art uses the Wheatstone bridge for power regulation. Second, that the Wheatstone bridge is therefore used when the heater is energized. And third, that the teachings of the prior art are based on the concept of maintaining the temperature of the heater.

Regarding the first two facts, the approach of Claim 2 is to use the Wheatstone bridge in generating the signal when the heater coil is de-energized. Whether or not the bridge is used to power the heater is not at issue. Regarding the third fact, maintaining heater temperature would in fact destroy any exhaust gas temperature sensing, since the resistance is maintained constant.

As such, the rejection of claim 2 should be withdrawn.

CLAIMS 4-5

Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Number 5,592,815 (Jelden) in view of Shimasaki and Seidenfuss.

Again, the above arugments with respect to Claim 1 apply to claims 4-5, as Jelden fails to cure the deficiencies of Shimasaki and Seidenfuss. Additionally, the teachings of Jelden contradict the approach of claim 1, in that Jelden aims at making temperature measurements "at all times". *See* the abstract. Since the exhaust gas oxygens sensors of the prior art, and the present application, make measurements at select instances, these approaches appear irreconcilable. As such, for this additional reason, the rejection of claims 4-5 should be withdrawn.

NEW CLAIMS 15 and 16, and Amended CLAIM 3

Applicants have added new claims 15 and 16. Support for the amendment is provided by Fig. 1, as well as page 5, lines 6-25, for example.

Applicants have reviewed the cited art and can find no disclosure of the combined system of claim 15. In particular, Applicants can find no switching circuit for coupling the electrical circuit to the electric heating coil during the de-energizing of the coil, and uncoupling the electric circuit from the electric heating coil during the energizing of the coil. Rather, Seidenfuss maintains the coupling of the measuring resistance R1 both during heating and measuring, such as shown by Fig. 1.

Conclusion

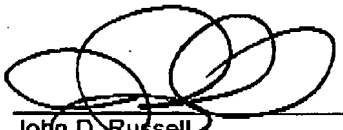
The new rejections rely heavily on Seidenfuss. As noted above, Seidenfuss is trying to diagnose functionality of a heater, not measure exhaust gas temperature. Thus, Seidenfuss is necessarily using an approach that purposefully confounds the measurement of exhaust temperature with information as to how much heat the heater is supplying. Furthermore Seidenfuss gives no information as to how accurate measurements of exhaust gas temperature can be extracted from a measurement aimed at diagnosing heater functionality. Rather, as noted above, Seidenfuss simply tries to identify whether the heater is working properly.

Applicants believe that this application is now in condition for allowance, in view of the above amendments and remarks. Accordingly, Applicants respectfully request that the Examiner issue a Notice of Allowability covering the pending claims. If the Examiner has any questions, or if a telephone interview would in any way advance prosecution of the application, please contact the undersigned attorney of record.

Please charge any cost incurred in the filing of this Response, along with any other costs, to Deposit Account No. 06-1510.

Respectfully submitted,

ALLEMAN HALL MCCOY RUSSELL & TUTTLE LLP



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